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ABSTRACT

One of the results of the seventeenth-century revolution in learning was the rejection by scientists of classical rhetorical theories. The scientific societies established in colonial America reflected the European wish to replace the classic emphasis on "artificial" rhetorical style by making language usage more concrete, simple, and clear. In particular, they opposed the use of such rhetorical devices as figures of speech, "eloquent" writing, or "mere style." In the mid-nineteenth century, however, when the American Association for the Advancement of Science was founded, there was evidence of reaction against the "pure" scientific language usage and more critical attention paid to improvement of communication. The new concept of language usage emphasized a practical, utilitarian style of writing that would also require the scientist to study literary works to learn basic principles of rhetoric and composition. Scientific writings now draw upon the principles of communication first delineated by the classical rhetoricians--investigation, recollection, judgment, arrangement, and expression--but there is no evidence of any philosophical analysis of the "rhetoric of science literature" which might lead to a well-defined art of scientific discourse. (RN)

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SEVENTEENTH CENTURY REFLECTIONS IN THE RHETORIC OF SCIENCE IN AMERICA

Joseph W. Wenzel

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In Gulliver's Travels, Swift described a visit to the grand academy of Lagado. One of the projects to be observed in the school of languages there

> was a scheme for entirely abolishing all words whatsoever: . . . . since words are only names for things, it would be more convenient for all men to carry about them, such things as were necessary to express the particular business they are to discourse on. . . . many of the most learned and wise adhere to the new scheme of expressing themselves by things; which hath only this inconvenience attending it; that if a man's business be very great, and of various kinds, he must be obliged in proportion to carry a greater bundle of things upon his back, unless he can afford one or two strong servants to attend him. I have often beheld two of those sages almost skinking under the weight of their packs, like pedlars among us; who when they meet in the streets would lay down their loads, open up their sacks, and hold conversation for an hour together; then put up their implements, help each other to resume their burthens, and take their leave.[1]

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Swift's contemporaries could be expected to recognize this as a burlesque of the Royal Society of London. For the rhetorical theorist it calls attention to one of the most interesting features of the revolution in learning that took place in the seventeenth century, namely the rejection by the growing school of scientists of the older, rhetorical theory of communication, and their search for an alternative. As the old learning was imbedded in a world of words, and in the scientists' view, as the old learning prized the words and ignored the realities of nature, so all verbal expression and all the arts of language became suspect. As R. F. Jones has said, "It is difficult for us to realize the extremes to which this distrust of language was carried. Its frequent appearance during the formative period of modern science bears conclusive testimony to the fact that all verbal media of communication were considered one [sic] of the greatest obstacles to the advancement of learning. Yet even the scientists realized that language was at least a necessary evil, if they wished to share their discoveries with others. This realization inspired in them a desire to reduce language to its simplest terms, to make it as accurate, concrete, and clear an image of the material world as was possible."[2] The history of their efforts to that purpose has been detailed by several scholars, and it is not my intention to repeat it in this paper.[3] The purposes of this paper are (1) to illustrate how those same concerns for the problems of scientific communication were reflected in early American scientific societies; and (2) to describe how the hostility toward artful communication eventually gave way to the practical demands for an art of scientific communication. I would also like to

speculate a bit on the failure of those concerned to complete a philosophical analysis of the nature of scientific communication which would have been necessary to produce a clearly articulated "rhetoric of science."

Following Bacon's manifesto, the scientific virtuosi of the seventeenth century championed their "new philosophy" in a clash of whole cultures. Rhetoric, of course, was an integral part of the older learning, and rhetoric came under attack at every vital point. The "experimental philosophers" attacked the traditional sources of proof and the authority of the ancients. They attacked the systems of topoi as means to discovery, for they led to mere abundance, not weight of matter. They rejected the artificial Ciceronian scheme of rhetorical arrangement. Most vigorously of all, they attacked the study and cultivation of style as ornament by the employment of schemes and tropes. In the attack on rhetorical style, especially, we may see that scientific men were rejecting the very function of rhetoric, as they perceived it in practice around them. Under the influence of Ramus and the writers of neo-Ciceronian stylistic rhetoric, the art had been reduced to that elaborate system of schemes and tropes which so invite abuse. It may not be too much to say that, at the extremes of abuse, style had lost all functional connection with the substance of discourse. For the courtier who studied rhetoric in order to cut a clever figure at court, for the divine who studied rhetoric in order to bedazzle a congregation, style had gone beyond its function as ornament of discourse to become a veritable ornament of person. The purpose of words in such cases was not to refer to matters of fact or thought, but to signify the cleverness of the speaker. It is no wonder, then, that

the virtuosi who sought to discover and convey knowledge of nature should reject the art of rhetoric and the culture it served.

With the founding of the Royal Society, modern science gained an official agency for promoting scientific investigation, and also for establishing standards for scientific communication. In the rules of the Society enacted in 1663, we find the proviso: "In all Reports of Experiments to be brought into the Society, the matter of fact shall be barely stated, without any prefaces, apologies, or rhetorical flourishes. . . ."[4] And in Sprat's History of the Royal Society, of course, are those familiar passages which deplore the "many mists and uncertainties, these specious Tropes and Figures have brought on our Knowledge," and report the Society's resolution "to return back to the primitive purity, and shortness, when men deliver'd so many things, almost in an equal number of words."[5]

From the very beginning, the Royal Society "exerted great influence upon the intellectual and scientific life of the [American] colonies."[6] Among early Americans who were elected fellows of the Society were Cotton Mather, Roger Williams, the three John Winthrops, Benjamin Franklin (who was to become the first president of the American Philosophical Society), and James Bowdoin (who was to become the first president of the American Academy of Arts and Sciences).[7] "For more than a hundred years," observed one historian, "the Royal Society was the chief resource of naturalists in North America . . . . and the Philosophical Transactions [of the Royal Society] contained many American papers."[8] Historians of science agree that the first two permanent American scientific societies were modelled upon the Royal Society:

> There is general agreement that the Royal Society of London exerted a profound influence upon Americans during the colonial period. There is reason to believe, also, that the Society's influence did not terminate with the American revolution, since it is obvious that the first two independent scientific societies in this country, the American Philosophical Society, at Philadelphia, and the American Academy of Arts and Sciences, at Boston . . . bear marked resemblances to the Royal Society in plan of organization, procedure, and scientific objectives. This imitation of the English organization indicates that colonial Americans had been impressed by the successful methods employed by the Royal Society in propagandizing scientific doctrine and in recruiting scientific practicioners.[9]

Under Benjamin Franklin's leadership, the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge was founded in 1743. Bostonians followed their neighbors' example in 1780 with the establishment of the American Academy of Arts and Sciences.

In the publications of these two American societies, especially, one finds a clear reflection of the influence of the Royal Society on scientific style. There is, first of all, the implied perference for <u>things</u> over <u>words</u>. In a biographical memoir, for example, a professor of medicine was praised for having been "one of the leaders in that great reform in instruction upon scientific subjects, which has now become universal; in

which illustration and demonstration, by the constant presentation of objects to the sight, are prominent and essential."[10] In another case, style is commend because "we see, at once, the ideas he would express, as distinctly as we behold material objects in a clear sky."[11] Insofar as words are useful, it is because they refer to things with precision: ". . . as science only deals with phenomenon [sic] and the laws which connect them, so all the terms which it uses have exact literal meanings, and refer only to things which admit of being perceived by the senses, or, at least, of being conceived as thus perceptible."[12]

The obituary notices and biographical memoirs of the societies are a primary source for the members' attitudes towards the arts of language, for they contain frequent discussions of style. Although it would be overstatement to say that <u>every</u> reference to eloquence or to rhetoric is perjorative, that is nearly the case. A few examples will illustrate the sort of comment found frequently:

> The style of these and all his writings is plain, easy, and without any affectation or display. . . . In his oral teaching he was clear, minute, and explicit, thinking nothing of effect or eloquence. . . .[13]
>
> As a writer, he was compact, clear, and strong. No style could be more free than his from rhetorical artifice.[14]
>
> The lectures of the following year . . . were really of a higher quality, more carefully studied, less rhetorical, richer in matter, more precise in statement, and more instructive in exposition and criticism.[15]

> Dr. Bache's writings and public teaching were marked by his characteristic intellectual traits. Simplicity, clearness, truthfulness, accuracy, and method were their chief qualities, in regard both to material and arrangement. . . His style was easy and remarkably correct . . . and his language pure, idiomatic English. His published writings are entirely exempt from any appearance of effort or attempt at display. The purely ornamental is eschewed entirely. Figures of speech, flights of fancy, and flowers of rhetoric, are unknown to them.[16]

So it appears that for early American scientists, the art of rhetoric was associated essentially with style. No doubt, the influence of Ramus was in part to blame, for his conception of rhetoric was the dominant one in American colleges well into the eighteenth century.[17] But it also seems likely that the general hostility to the "ancient learning" and its art of discourse was still operative.

There is another curious echo of the seventeenth century to be found in comments by American scientists, and that is a certain impatience with matters of mere language. In an obituary notice of Benjamin Silliman, it is clearly associated with the utilitarianism that characterized science throughout the period:

> It seems to me that the utility of science, in its broadest sense, was always uppermost in his mind. He is always tracing abstract principles to their practical applications. In his several books and papers, he aims at the accomplishment of useful

> ends. His style of writing looks to this. It is direct, simple, perspicuous. Its only object seems to be to expound clearly the subject under consideration. It is business-like. It reads as if the author had too many important matters on his hands to occupy himself in the mere refinements of style.[18]

Despite their impatience with "mere style," however, scientists in both England and America were forced to attend to their discourse in order to make it an effective instrument in the propagation of the new learning.

Given the attitudes that have been briefly sketched here, one is not surprised to find an American scientist beginning an address to his colleagues with the remark, "I am not therefore at liberty to exercise the talents of an orator, if I possess them, but am restrained by the more rigid academic rules."[19] One is a bit perplexed, however, to find in the publications of the societies no very clear articulation of those "academic rules." At least until about the middle of the nineteenth century, the prescription for scientific discourse remains a rather vague bundle of admonitions to be brief, clear, methodical, artless. There is also, however, a certain ambivalence of attitude toward the arts of language. It can be seen even in Sprat's <u>History</u>, in his grudging acknowledgement that rhetoric must have a place in civil society.[20] But the ambivalence grows stronger as the nineteenth century progresses. It is the tension between the desire for artlessness in scientific discourse on the one hand, and on the other, the growing realization that any form of discourse must be governed by art if it is to be perfected. Hence, about the middle of the nineteenth century, the general proscription against the rhetoric of

ornamentation gradually gives way to a general prescription for a new rhetoric conceived to meet the needs of a new age. That recognition of a "new" rhetoric appears most clearly in the publications associated with America's third major scientific society, The American Association for the Advancement of Science, founded in 1848. Without the regional attachments of the earlier societies, with a broader membership base, and holding its annual meetings in various parts of the country, the American Association became the dominant scientific association in the United States.

By the middle of the nineteenth century, American science had become so well developed, so specialized, and so diffused, that one member of the Association was led to declare that "the present age of science may . . . be called the monographic age. We have reached that period when every subdivision of research needs to be presented in the form of a monograph. . . . [The] need of a direct and disembarrassed presentation of all positive results, stated as far as possible in the common language of science, will become continually more pressing."[21] Such demands for efficient communication, increasing criticism of scientific writing, and the development in the schools of a new conception of rhetoric as an art of effective prose composition, all combined in the late nineteenth century to establish a role for rhetoric in scientific discourse.

Critical attention to the writing of scientists was reflected by educators such as Charles Eliot, who observed that "no men have greater need of the power of expressing their ideas with clearness, conciseness, and vigor. . . . In such writings embellishment may be dispensed with, but the chief merits of style--precision, simplicity, perspicuity, and force--are never more necessary."[22] Within the scientific societies, also, it

was becoming clear that a determined artlessness did not lead to satisfactory communication. Chiding those who "are unwilling to take the trouble to write for their readers or speak for their hearers," T. C. Mendenhall argued that good writing was an inherent part of good science, for "clear and accurate thinking is generally accompanied by the power of clear, concise, and accurate expressions, and that as a matter of fact the two are almost inseparable."[23] One final plea for better literary training in technical education reveals the change in attitudes neatly:

> Literary subjects have generally been looked upon as valuable because of the polish they are supposed to impart, and their presence in engineering courses has often been allowed rather than desired by technical instructors. This is a mistake. The success of an engineer does not depend alone on his professional attainments. He may build a bridge, the building of which requires of him the exercise of the highest engineering talent. The bridge may be a perfect success, and he may be well paid for his work, but if he stops at that point, his work is not as successful as it should be. If he is also able to write a paper embodying what is new in the work, read it before his engineering society, take a creditable part in its discussion, the whole being done in neat and attractive language, his usefulness to his profession, to the world, and to himself thereby increased. . . . The student should have literary work placed before him, and the practical value of that work should be pointed out and insisted on as in other subjects. He should

study the principles of rhetoric and composition, and apply them in practice on assigned topics, in which scientific and technical subjects should predominate.[24]

One of the most potent forces for the improvement of scientific communication in the last two decades of the nineteenth century was the magazine, Science, which eventually became an official organ of the American Association. Occasionally in articles, but especially in book reviews, the periodical carried criticism of scientific works and suggestions for improvement to virtually all scientific circles.[25] Typical of the editor's attitudes was the remark of Henry S. Carhart: "It is rather to be deprecated that scientific men do not generally pay more attention to the formation of a correct English style, and do not oftener acquire the ability to express the results of their studies in more elegant English diction."[26] Typical of the reviews which were a major service of the magazine was one which approved a work "in spite of some deficiency in rhetoric (so apt, with language, grammar, and logic generally, to be neglected by scientific men, to their own immense disadvantage in respect of easy mental work as well as to the discomfort of their readers)."[27]

Criticism of practice in scientific writing, as in other genres, no doubt interacted reciprocally with the revision in rhetorical training that was taking place in the schools. In reviewing the evolution from the perspective of the Boylston Professorship, Ronald Reid noted, "By the time of [Adam Sherman] Hill's retirement [1904], what was called "rhetoric" was concerned not with oratory, but with written composition, expository and literary as well as persuasive."[28] The new conception of rhetoric was

well suited to the needs of science in three particular respects. First, it emphasized written exposition, the typical medium of scientific discourse. Secondly, it appealed primarily to utilitarian rather than aesthetic criteria. Thirdly, by slighting the canon of invention and emphasizing structure and style, the new rhetoric tended to preserve the Ramistic dichotomy of matter and manner. Matter was the concern of the special sciences, for as Hill taught, "rhetoric does not undertake to furnish a person with something to say; but it does undertake to tell him how best to say that with which he has provided himself."[29] Thus it was that the practical demands of their enterprise led American scientists eventually to attend more carefully to their discourse, and to welcome an art of communication which would serve to improve it.

I have emphasized the practical, utilitarian outlook which marked the scientists' concern with communication, for it may be contrasted with another approach which is remarkable for its absence from their societies' publications. I refer to the lack of any indication of a philosophical analysis of scientific discourse, which might have led to a well designed, well articulated, and complete art of scientific discourse. It is clear that the new rhetoric which scientists found acceptable was an incomplete rationale. For it is equally clear, that the essential functions of communication--investigation, recollection, judgment, arrangement, expression--which were handled by the classical canons, are just as necessary to scientific communication as to any other kind. As it turned out, the scientific community did evolve principles relevant to all of the classically conceived functions of the communicator: they drew from scientific method itself proof requirements for disputation which are parallels to stasis

systems; they developed topical systems of a general kind based on the scientific method, and of special types grounded in the classifications of the special sciences; they laid down ethical principles associated with the scientific method which established the proper uses and limits of authority; they considered patterns of arrangement in relation to purpose and integrity of subject matter; and they developed general principles of scientific style, along with special methods for handling the complexities of nomenclature.[30] Yet each of these developments seems to have come as a response to specific problems, not as a response to philosophical inquiry.

The absence of any philosophical approach to the "rhetoric of science" is surprising in light of the "ancestors" who had begun such an analysis. Bacon was revered by Americans, as well as by Englishmen, but his careful delineation of the "Art of Transmission" does not seem to have made a great impression upon them.[31] Even Robert Boyle had written clearly of the difference between the fashion of rhetoric that might prevail at any time and place and the enduring functions of the art.[32] Perhaps it was the attraction of the new world, with so much work to be done, that kept the scientists of this nation attentive to things and not words. And, no doubt, their impatience with discourse, which we have noted, was related to the demands of exploring a new world. Perhaps Sprat had already answered the question when he observed: "It cannot therefore be suspected that these Inquisitive Men, should busy themselves, about altering the Art of Discourse, wherin they judge that mankind has bin already rather too Curious, than negligent."[33]

In any case, in the first century and a half of their existence, American scientific societies came to grips with their special problems of communication, and evolved a set of precepts which may, in a loose sense, be called a "rhetoric of science." By the end of the nineteenth century, the revolution against the older culture of the scholastics was complete, and along with it had come a revolution in communication. Perhaps a fitting conclusion for this account of a piece of the revolution is the nostalgic recognition of the change by J. P. Lesley, a retiring president of the American Association:

> There were once halcyon days for orators: the world of knowledge limited, and canopied with rosy clouds of curious speculation; the birds of fancy singing in every bush; the dew of novelty glittering on the fields. Science was then an early morning stroll with sympathetic friends, uncritical and inexpert, to whom suggestions were as good as gospel truths.
>
> . . . . . .
>
> You represent this new world, grown so suddenly old, learned, utilitarian and critical. Your orators have a hard time of it.[34]

NOTES

[1]Jonathan Swift, Gulliver's Travels; vol. 36 of Great Books of the Western World (Chicago: Encyclopaedia Britannica, Inc., 1952), p. 111.

[2]Richard F. Jones, "Science and Language in England of the Mid-Seventeenth Century," Journal of English and Germanic Philology, 31 (1932), 315-331.

[3]Wilbur S. Howell, Eighteenth-Century British Logic and Rhetoric (Princeton: Princeton University Press, 1971), pp. 448-502 especially; Richard F. Jones, Ancients and Moderns: A Study of the Rise of the Scientific Movement in Seventeenth-Century England (2nd ed.; Berkeley: University of California Press, 1961); R. F. Jones, "Science and Language in England of the Mid-Seventeenth Century," loc. cit.; R. F. Jones, "Science and English Prose Style in the Third Quarter of the Seventeenth Century," PMLA, 45 (1930), 977-1009.

[4]Quoted in C. R. Weld, A History of the Royal Society with Memoirs of the Presidents, compiled from Authentic Documents; 2 vols. (London: J. W. Parker, 1848), II, 527.

[5]Thomas Sprat, History of the Royal Society, edited by Jackson I. Cope and Harold W. Jones (Washington University Studies; St. Louis, 1958), pp. 112-113.

[6]Frederick E. Brasch, "The Royal Society of London and Its Influence upon Scientific Thought in the American Colonies," Scientific Monthly, 33 (1931), 450.

[7]Ralph S. Bates, Scientific Societies in the United States (2nd ed.; New York: Columbia University Press, 1958), pp. 2-3. See also: Margaret Denny, "The Royal Society and American Scholars," Scientific Monthly, 65 (1947), 415-427; Raymond P. Stearns, "Colonial Fellows of the Royal Society of London, 1661-1788," Osiris, 8 (1948), 73-121.

[8]G. Brown Goode, "The Beginnings of Natural History in America," Proceedings of the Biological Society of Washington, 3 (1884-1886), 97.

[9]Margaret Denny, "The Royal Society and American Scholars," p. 415.

[10]Henry Hartshorne, "Memoir of George B. Wood, M.D., LL.D.," Proceedings of the American Philosophical Society, 19 (1880-1881), 125-126.

[11]Daniel A. White, "Eulogy on John Pickering . . .," Memoirs of the American Academy of Arts and Sciences, new series, 3 (1848), lvii.

[12]Simon Newcomb, "Address of . . . the Retiring President of the Association," Proceedings of the American Association for the Advancement of Science, 27 (1878), 3.

[13]Obituary of John Ware, Proceedings of the American Academy, 6 (1862-1865), 299.

[14]Obituary of Francis Wayland, Proceedings of the American Academy, 7 (1865-1868), 120.

[15]Obituary of Victor Cousin, ibid., 323.

[16]George B. Wood, "Obituary Notice of Dr. Franklin Bache," Proceedings of the American Philosophical Society, 10 (1865-1868), 135.

[17]George V. Bohman, "The Colonial Period," in A History and Criticism of American Public Address, ed. W. N. Brigance and M. K. Hochmuth (3 vols.; New York: Russell & Russell, 1960), I, 18-19; Ota Thomas, "The Teaching of Rhetoric in the United States during the Classical Period of Education," ibid., pp. 200-202.

[18]Alexis Caswell, "Biographical Notice of Benjamin Silliman, Sr.," Annual of the National Academy of Sciences for 1866 (Cambridge, Mass.: Welch, Bigelow, and Company, 1867), p. 121.

[19]John Lowell, "An Eulogy on the Honorable James Bowdoin," Memoirs of the American Academy, old series, 2 (1793), Part I, p. 6.

[20]History, p. 111.

[21]E. B. Hunt, "On an Index of Papers on Subjects of Mathematical and Physical Science," Proceedings of the American Association, 9 (1865), 128-129.

[22]Charles W. Eliot, "The New Education, Its Organization -- II," Atlantic Monthly, 23 (March, 1869), 359.

[23]T. C. Mandenhall, "The Relations of Men of Science to the General Public," Proceedings of the American Association, 39 (1890), 6-7.

[24]Benjamin F. Thomas, "Technical Education in Colleges and Universities," Proceedings of the American Association, 41 (1892), 76-77.

[25]"Comment and Criticism," Science, 4 (September 19, 1884), 270: ". . . a review which had been made of the subscription-list, by our publisher, shows that these pages now reach the chief scientific institutions and the chief scientific workers of the country."

[26]Henry S. Carhart, "The Eudcational and Industrial Value of Science," Science, new series, I (April 12, 1895), 397-398.

[27]Review of The Fifth Volume of Ohio Geology, Science, 6 (September 18, 1885), 257.

[28]Ronald F. Reid, "The Boylston Professorship of Rhetoric and Oratory, 1806-1904," QJS, 45 (1959), 239.

[29]Adams Sherman Hill, The Principles of Rhetoric (2nd ed.; New York: Harper & Brothers, 1895), p. v.

[30]These developments are treated at length in my dissertation: "The Rhetoric of Science: A Study of Comments on Technical Communication in American Scientific Societies, 1750-1900," University of Illinois, 1963.

[31]Karl R. Wallace, Francis Bacon on Rhetoric and Communication (Chapel Hill: University of North Carolina Press, 1943), passim

[32]Discussed by Howell, Eighteenth-Century British Logic and Rhetoric, pp. 464-481.

[33]History, p. 327.

[34]J. P. Lesley, untitled address as retiring President, Proceedings of the American Association, 34 (1885), 1-2.